12. Olinger, M. D.: Mixed infection in bacterial endocarditis: Report of two cases, Arch. Int. Med., 81:334, 1948.

13. Orgain, E. S., and Poston, M. A.: Mixed infections in bacterial endocarditis, Am. Heart J., 23:823, 1942.

14. Pankey, G. A.: Subacute bacterial endocarditis: A review of cases seen at the University of Minnesota Hospital, 1939-1959, Univ. Minnesota M. Bull., 31:557, 1960.

15. Schultz, R.: The problem of subacute bacterial endocarditis with negative cultures, J. Lancet, 77:291, 1957.

16. Taussig, H. B.: Congenital Malformations of the Heart, Vol. I, Harvard University Press, Cambridge, 1960, p. 167.

17. Weiss, H., and Ottenberg, R.: Relation between bacteria and temperature in subacute bacterial endocarditis, J. Infect. Dis., 50:61, 1932.

## Hydrocolpos in a Newborn Child

ROBERT T. PLUMB, *M.D.*, JANICE R. KELLY, *M.D.*, and JAMES R. DILLON, *M.D.*, San Diego

HYDROCOLPOS is a rare condition which occurs in newborn female infants as the result of stimulation of maternal estrogens. It consists of atresia of the vaginal outlet and excessive secretion of the cervical glands, and produces a midline mass and bulging at the introitus. It should be suspected when a midline mass is found in a neonatal female.

Various names have been applied to the condition. We have chosen to use *hydrocolpos* because the Greek roots of the word (*hydro*, the word for water, and *colpos*, a term pertaining to the vagina) explain its nature accurately—that is, a prominent early feature is the accumulation of non-bloody fluid in the vagina. The process has also been called *hydrometrocolpos*, a term that indicates involvement of the uterus, which may indeed occur secondarily but not always. Hydrocolpos should be differentiated from hematocolpos, which occurs at the time of menstruation.

Reports of hydrocolpos in the literature were reviewed quite thoroughly by Spence in 1961.[4] He stated that up to 1940 only 20 cases had been reported, only two of them in the English literature. From 1940 to the time of his review, 36 cases were reported in 20 articles, and an additional eight in textbooks. Spence added to these the reports of four cases that he had observed. Kereszturi[2] in 1940 reported on a case diagnosed at eight and one-half weeks, in which an excretory urogram was used for the first time to aid in the diagnosis; exploratory laparotomy, however, was necessary for confirmation. Kereszturi noted that the original case report in English was made by Godefoy in 1856.

A comprehensive review of the etiology was undertaken by Mahoney and Chamberlain in 1940.[3] There are two theories, both of which may be correct: (1) that an imperforate hymen is the true cause; and (2) that a thick membrane is responsible. The latter is considered to represent atresia similar to that of imperforate anus. The fluid accumulation is thought to be owing to placental transfer of the maternal estrogens, which stimulate the cervical glands. Evidence in support of this theory is found in reports of newborn gynecomastia and vaginal bleeding at birth. Spence[4] noted that in one of the cases he observed, relief of obstruction was obtained by incision and drainage when the patient was eight weeks old; reoperation at age six months revealed only a tiny amount of secretion.

Hydrocolpos is clinically apparent at birth, or within the first few weeks of life. However, if it is

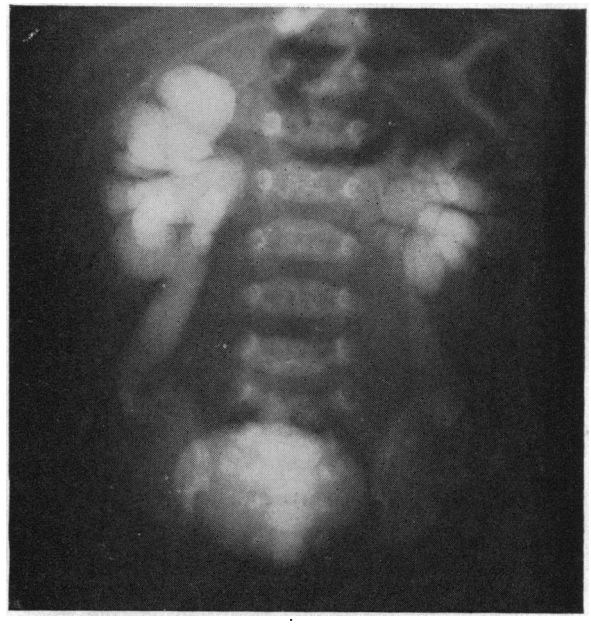

Figure 1.—Urogram seven hours after birth. Note bilateral hydronephrosis. There is a complete left duplication anomaly (not well seen in reproduction).

Presented before the Section on Urology at the 92nd Annual Session of the California Medical Association, Los Angeles, March 24 to 27, 1963.

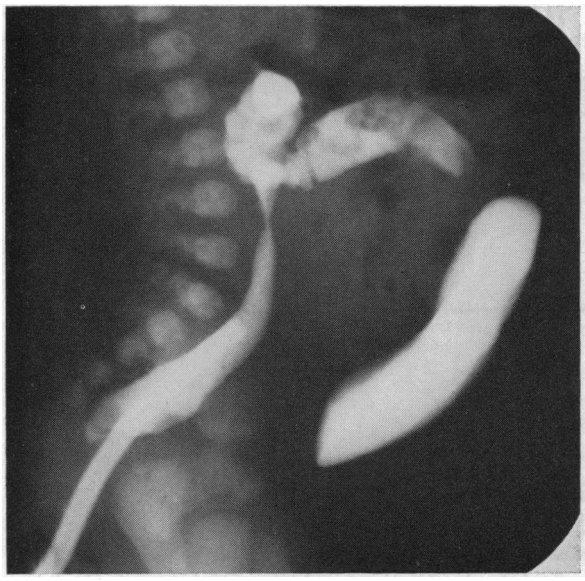

Figure 2.—Hypaque® enema and urinary bladder cystogram (lateral view) revealing large space between each.

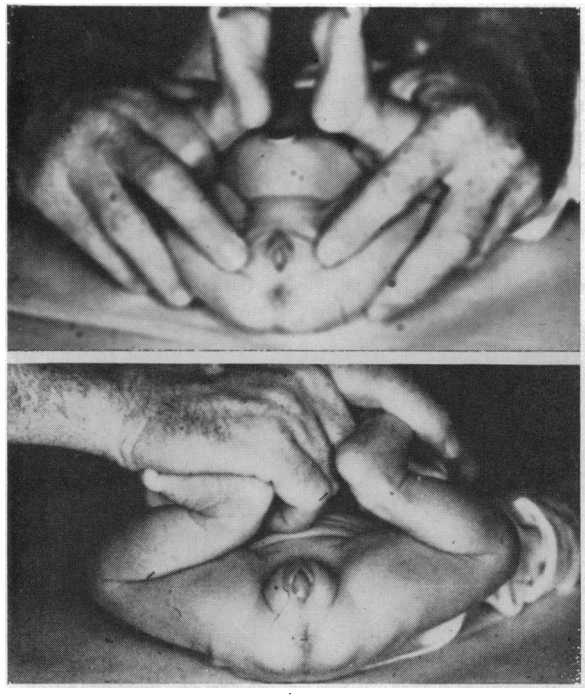

Figure 3.—*Above,* introitus with baby not crying. *Below,* introitus with baby crying. Note bulging membrane.

not recognized early, it may not be identified until puberty, at which time a foul, purulent material (rather than bloody fluid) appears. Because improper diagnosis leads to disastrous end results, while correct diagnosis and relatively simple treatment result in cure, we are led to present our recent experience with a case.

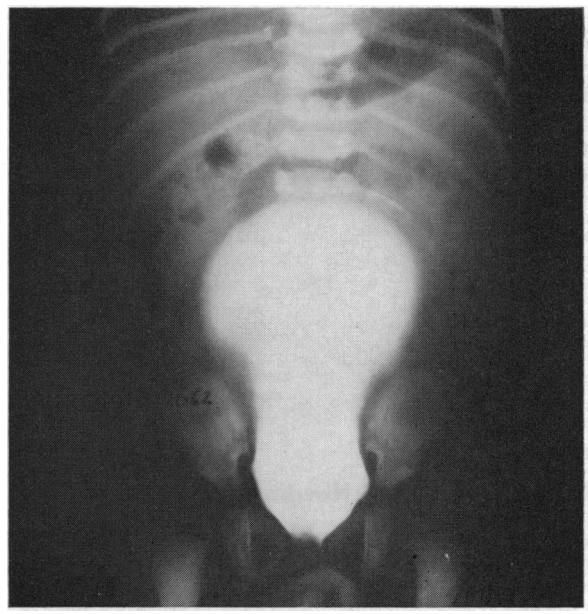

Figure 4.—Vaginogram, made after withdrawal of 30 ml of fluid and injection of 30 ml of Hypaque® in 1:1 dilution. Note air contrast.

### REPORT OF A CASE

A female child, one of twins, was noted to be unable to void after 24 hours, and was catheterized. A midline mass and a bulging mass at the introitus were recognized. The pediatrician ordered radiologic studies. An intravenous urogram (Figure 1) showed decided obstruction of both ureters, similar to that seen in hydronephrosis of pregnancy. In addition, the superior duplication anomaly of the left kidney was not involved in the obstructive process. Roentgen studies after an enema of diatrizoate sodium (Hypaque®) showed the rectum to be displaced posteriorly and laterally. A cystogram showed that the bladder was pushed anteriorly (Figure 2).

The child was restless, would not eat properly and had difficulty with voiding. Physical examination by one of the authors on the fifth day confirmed the pediatrician's findings, including a soft midline mass. It was difficult to outline the exact edges of the diffuse mass, but it appeared to fill the entire abdomen to above the umbilicus. Each time the child cried, a large bulging membrane presented itself at the introitus. When abdominal pressure was not exerted, the mass retracted and the introitus appeared normal (Figure 3). The urethra was recognized in its normal position. A catheter was easily introduced into the urethra and urine was passed in amounts ranging from 50 to 100 ml. The urine was chemically within normal limits and no abnormal contents or organisms were observed on microscopic examination or on culture.

The child was taken to the operating room, where all previous findings were confirmed. A No. 18 (French) needle was inserted into the membrane at the introitus, and 30 ml of milky, white fluid was removed and sent for culture and for cell block study. The culture was negative for pathogenic organisms and the cell block revealed normal, estrogenically-stimulated cells. Thirty milliliters of Hypaque was injected and a vaginogram was made (Figure 4). This confirmed the suspected diagnosis. The uterus did not appear to be involved. A linear incision was made in the introitus membrane, which permitted the remaining fluid (estimated at about 200 ml) to escape and left the introitus wide open.

The restlessness and feeding problem disappeared and the child was able to void normally. She was discharged home on her second postoperative day and remained normal throughout the ensuing two months. She was then readmitted for urological evaluation. Repeat intravenous pyelograms and cystogram were made, and cystoscopy was done. The intravenous pyelograms showed pronounced improvement since the relief of pressure, with an approximately 80 per cent return to normal. There was reflux up all three ureters (Figure 5). Cystoscopy revealed a normal bladder neck and no residual urine. (The child will be followed closely, and it is hoped to observe the urinary tract periodically through puberty.)

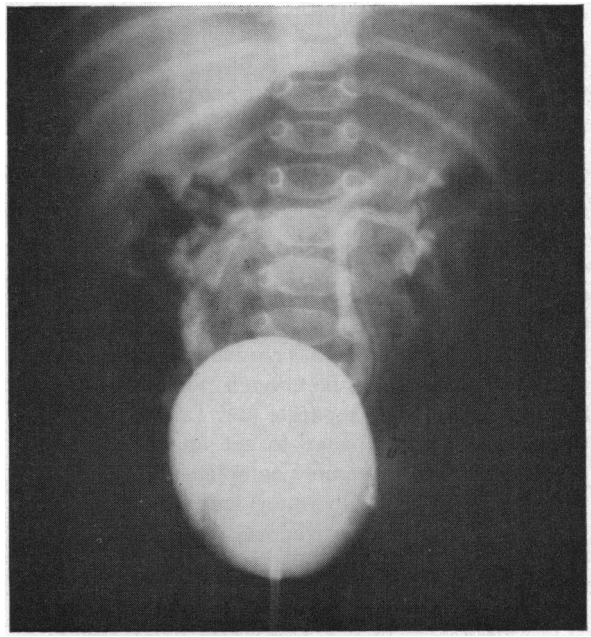

Figure 5.—Reflux cystogram two months after operation. Reflux was present in all three ureters.

## DISCUSSION

Spence[4] reported that in 25 of 40 cases of hydrocolpos the condition was recognized before the patient was two weeks old. His review showed that the major physical signs are an abdominal mass, vaginal bulge and urinary obstruction, such as were noted in the case reported herein. However, it is also necessary to be on the alert for gastrointestinal symptoms, for evidence of circulatory obstruction or for imperforate hymen without a bulge. Any one of these findings may lead the clinician to suspect hydrocolpos. It is most important to observe the patients in a good light, and to watch for the vaginal bulging which occurs with crying or with abdominal pressure. Typically, the midline mass does not disappear on catheterization. When these physical signs are present, the diagnosis can be proved by aspirating some of the fluid and injecting opaque medium for x-ray verification. In addition, air contrast films of the bladder may be helpful. Air contrast was not used in the present case because the films already made were sufficient to make the diagnosis certain.

Once the proper diagnosis has been made, treatment consists of prompt incision of the membrane. Any of several types of incision may be used—cruciate or linear, or marsupialization of the membrane by sutures may be carried out. Any method which leaves the membrane open and gives adequate drainage will suffice. Laparotomy is not necessary, and should be avoided.

## CONCLUSION

Hydrocolpos is a rare disease entity found in neonatal females. Failure to identify it promptly may lead to death or to irreversible urinary disease. A midline mass which does not disappear on catheterization and the presence of a bulging membrane at the introitus on crying or pressure are the clues to diagnosis of this congenital anomaly. Simple aspiration or incision of the membrane will suffice to save a life.

2850 Sixth Avenue, San Diego, Calif. 92103 (Plumb).

## REFERENCES

1. Cross, R. E.: Surgery of Infancy and Childhood. Philadelphia: W. B. Saunders Co., 1953, p. 444.

2. Kereszturi, C.: Imperforate hymen causing hydrocolpos, hydroureter, hydronephrosis, and pyuria: its occurrence in infant, Amer. J. Dis. Child., 59:1290-1297, June, 1940.

3. Mahoney, P. J., and Chamberlain, S. W.: Hydrometrocolpos in infancy: congenital atresia of vagina with abnormally abundant cervical secretions, J. Ped., 17:773, December, 1940.

4. Spence, H. M.: Congenital hydrocolpos, J.A.M.A., 180:1100-1105, June 30, 1962.